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Mössbauer transition dynamics in conditions of strong excitation of nuclear spins

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Abstract

The state of the art Mössbauer spectroscopy has made unquestionable advance possible in the solid microstructure study. Apart from that application of the Mössbauer effect, another domain of investigations has been outlined since the outset, in the sixties, wherein the properties of gamma-radiation interaction with resonant nuclei in a recoilless mode are stressed. There were these recoilless processes that enabled to distinguish the gamma-radiation of natural width, and greatly encouraged the arising of traditional optics problems in the gamma range. The subject of interest in this article deals as well with the Mössbauer gamma optics. Essentially it is a gamma-ray (Mössbauer) susceptibility of the excited, non-equilibrium state of the nuclear spin system. We analyze the Mössbauer transitions in the strong coherent excitation of nuclear spins regime and the possibilities to deliberately vary the polarization, spectral and/or temporal properties of gamma-radiation propagating through a time-modulated medium.